THE CASE FOR THE SUPPRESSION OF R. LUDWIG'S "CORALLEN AUS PALÄOLITHISCHEN FORMATIONEN" (*PALAEONTOGRAPHICA*, **14** : 133–244; 1865–66) FOR THE PURPOSES OF ZOOLOGICAL NOMENCLATURE. Z.N.(S.) 495

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In 1934, Lang & Smith published a paper in which they proposed applying to the International Commission on Zoological Nomenclature for the suppression of the new generic names of Palaeozoic corals published by Ludwig (1865–66). In this paper, they set out in some detail their reasons for this step. Lang, Smith & Thomas (1940 : 202) in reiterating the necessity for suppressing Ludwig's genera, stated that Lang & Smith had applied to the Commission for an opinion on the matter. Due to an oversight, however, it was not until 1950 that they actually wrote to the then Secretary, Mr. Francis Hemming, to present their case. A brief correspondence followed but before their proposals could be formally published Smith died and the action was suspended.

Meanwhile, palaeontologists had generally deferred to Lang & Smith's proposal and to the present day, mention of Ludwig's work has usually been accompanied by reference to Lang & Smith (1934). The situation has thus arisen that, although no Opinion has been given, and indeed no official proposal made, most Palaeozoic coral specialists have acted as though Ludwig's genera had been suppressed.

The present case is submitted in an attempt to rationalise this situation which has recently come to the writer's notice. Much of the argument presented is selected from that prepared by Lang & Smith. It should be mentioned that during their correspondence with the Commission, they decided to amend their case to the suppression of Ludwig's work as a whole for the purposes of the Law of Priority but not for those of the Law of Homonymy. The writer agrees with the necessity for this course and the proposal is made accordingly.

Ludwig (1865–66) erected 56 new genera[1] and 109 new trivial names for Palaeozoic corals which he classified in 37 new tribe (Ludwig's Sippe) and family categories (see Appendix). Many of his new names at the generic level and above are lengthy and confusing. Furthermore the classification he introduced was both fanciful and unsound and it has never been accepted in any form by subsequent workers. His figures are often diagrammatic and unsatisfactory, many of them carrying artificial septal notations (see Lang & Smith 1934 : 79; Duncan 1872 : 177).

A number of Ludwig's type-species were the type-species of existing genera. Furthermore, he altered, without reason, the trivial names of many existing species. For example, Ludwig (1866 : 243) said that "*Astroplacocyathus*

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[1] Lang & Smith (1934 : 78), although crediting Ludwig with 56 new genera, only listed 54 names, one of which, Diorygmaphyllina, does not belong to the generic category. They missed out *Astrocyclus*, *Lioblastolopas* and *Liocalamocyathus* (Ludwig 1866 : 184, 224 and 214 respectively). The list is correct in Lang, Smith & Thomas (1940 : 201).

solidus Ldwg." was "*Astraea porosa* Goldfs. pars", Goldfuss' species being the type-species of *Heliolites* Dana (1848 : 541). Similarly, "*Taeniochartocyclus planus* Ldwg." (1866 : 233) was said to be "*Pleurodictyum problematicum* Goldfs." which is the type species of *Pleurodictyum* Goldfuss (1829 : 113) (see Duncan 1872 : 117).

Also within his work, Ludwig introduced many inconsistencies and occasionally made his genera synonymous with each other. For example, "*Astroblastothylacus profundus* Ldwg." (1866 : 230) was said to be "*Cyathophyllum hexagonum* Goldfs. pars" and "*Astrophloeothylacus vulgaris* Ldwg." (1866 : 190, 239) was said to be simply "*Cyathophyllum hexagonum* Goldfs." Ludwig's two species are thus synonyms as defined and both are the type-species by monotypy of their respective genera. Similar cases were described by Lang & Smith (1934 : 79 *et seq.*; 1935 : 540 *et seq.*).

The foregoing points illustrate the general nature of Ludwig's work. The principal arguments on which the case rests however, arise from the almost total neglect of this publication by other specialists to date and the consequent threat to nomenclatorial stability which would follow its recognition. These are as follows:

1. None of Ludwig's supra-generic categories appears to have been accepted or even mentioned by any other author.

2. Except for wholly critical papers such as those by Duncan (1872) and, of course, Lang & Smith (1934, 1935), references to Ludwig's work have appeared in the following:—
   (a) Kunth (1869 : 185, 189, 198, 201, 208, 647 *et seq.*; 1870 : 30, 38, 41) who makes several general observations on Ludwig's work and describes three of his species as senior synonyms.
   (b) Frech (1885 : 114; 1886 : 170, 193), who referred to three of Ludwig's species as senior synonyms, and to may others as junior synonyms.
   (c) Schindewolf (1931 : 331), who noted that *Alleynia* Počta (1902 : vi) (=*Syringaxon* Lindström (1882 : 20)) was apparently a synonym of *Ptychocyathus* Ludwig (1865–66 : 139, 184, 187, 194–8). Prantl (1938 : 22), however, although accepting the synonymy, rejected the use of *Ptychocyathus* in deference to Lang & Smith's (1934) proposal and this has been accepted by all subsequent workers.
   (d) Schouppé (1949 : 127, 139, 145, 148), who discussed junior subjective synonyms of *Taeniocalamolopas* Ludwig but did not use the genus in his systematic work. He also referred to three of Ludwig's species, none of them as a senior synonym.
   (e) Schlüter (1881 : 206); Smith (1915 : 265); Smith & Tremberth (1929 : 366, 369); Schindewolf (1942 : 64, 65, 68) and Smith (1945 : 20) who either mention Ludwig species or genera as junior synonyms, or make brief critical reference to his work.

3. Due to the non-acceptance of Ludwig's work, many generic names in general use today are junior synonyms of genera erected by Ludwig. For example, *Syringaxon* Lindström and *Ptychocyathus* Ludwig (see section 2(c) above). Also *Phacellophyllum* Gürich (1909 : 102) (=*Thamnophyllum* Penecke (1894 : 563)) is a junior subjective synonym of *Taeniocalamolopas* Ludwig (1866:

218) (see Lang & Smith 1935 : 562; also Schouppé 1949 : 128) and *Hexagonaria* Gürich (1896 : 171), type-species *Cyathophyllum hexagonum* Goldfuss (1826, pl. 20, figs. 1a, b), is a junior objective synonym of both *Astroblastothylacus* Ludwig and *Astrophloeothylacus* Ludwig (see p. 157 above).

4. Recent opinion on Ludwig's generic names can be summarized by reference to the French, American and Russian treatise on invertebrate palaeontology. Lecompte (1952) and Hill (1956) disregarded all of Ludwig's genera except *Tetraphyllum* which Lecompte (1952 : 485) quoted as a synonym of *Polycoelia* King (1849 : 388) and which Hill (1956 : 260) quoted as a synonym of *Calophyllum* Dana (1846 : 183) (*Tetraphyllum profundum* Ludwig (1865 : 154) is an objective synonym of *Calophyllum profundum* Geinitz (1861 : 110) = *Cyathophyllum profundum* Geinitz (1842 : 579) which is the type-species of *Calophyllum* and of *Polycoelia*). Soshkina & Dobrolubova (1962 : 345) referred to Lang & Smith's application to suppress Ludwig's genera with which they concurred, quoting their reasons almost verbatim from Lang & Smith (1934). None of Ludwig's genera is mentioned in the systematic section of the work.

5. Similarly it is believed that only one of Ludwig's trivial names is in current use as a senior synonym. This is *Astroblastodiscus planus* Ludwig (1886: 228, pl. 67, figs. 1, 1a, 1b) = *Cyathophyllum* (*Peripaedium*) *planum* (Ludwig) Birenheide (1963: 398)[2].

The recognition of Ludwig's work would thus result in great confusion in coral literature and would threaten the stability of many Palaeozoic coral taxa. Moreover, the fact that the actual specimens on which Ludwig based his work are virtually all lost[3] means that many of his taxa would be very difficult, if not impossible, to recognize. It is therefore proposed that the International Commission use its plenary powers to suppress the work of Ludwig (1865–66) for the purposes of the Law of Priority but not for those of the Law of Homonymy and place it on the Official Index of Rejected and Invalid Works in Zoological Nomenclature.

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[2] Dr. Birenheide is to submit a separate case for the retention of this name.

[3] A large part of the material described by Ludwig was in his personal collection which was offered for sale just before his death in 1880 (Verkaufsanzeige. *Neues Jb. Miner. Geol. Paläont.*, **1877** : 224). The contents of the collection were widely scattered and enquiries among museums in Germany indicate that much of the Palaeozoic coral material was destroyed during the last war. Only specimens of six species erected by Ludwig (1865–66), all in the Hessisches Landesmuseum, Darmstadt, are known to be extant (see Appendix). I am grateful to Dr. Hermann Jaeger (Humboldt-Universität zu Berlin), Dipl.-Geol. Dieter Wayer (Zentrales Geologisches Institut, Berlin) and Dipl.-Geol. H. Weigelt (Hessisches Landesmuseum, Darmstadt) for this information.

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Appendix

The following is a list with full page and plate references of all those names of family rank and below erected by Ludwig (1865–66) which would cease to be available with the success of the present case. Species of which figured specimens are known to exist in the Hessisches Landesmuseum, Darmstadt, are indicated by an asterisk.

Families: Anablasta : 139, 185, 222; Chartoplintha : 139, 185, 231; Dendrophora : 139, 185, 213; Phloeoda : 139, 186, 235; Placoda : 139, 186, 242; Thromboda : 139, 186, 240.

Tribes ("Sippe" of Ludwig): Anorygmaphyllina : 142, 153; Astroanablasta : 185, 227; Astrochartoplintha : 186, 234; Astrocyathina : 139, 183, 203; Astrodendrophora : 185, 220; Astrophloeoda : 186, 237; Astroplacoda : 243; Astrothromboda : 242; Diorygmaphyllina : 143, 162; Hexorygmaphyllina : 144, 174; Liochartoplintha : 186, 231; Liocyathina : 139, 183, 191; Liodendrophora : 185, 213; Lioanablasta : 185, 222; Liophloeoda : 186, 235; Lioplacoda : 242; Liothromboda : 240; Ptychoanablasta : 185, 224; Ptychochartoplintha : 186, 231; Ptychocyathina : 139, 183, 194; Ptychodendrophora : 185, 215; Ptychophloeoda : 186, 236; Ptychoplacoda : 243; Ptychothromboda: 240; Taenioanablasta : 185, 226; Taeniochartoplintha : 186, 233; Taeniocyathina : 139, 183, 199; Taeniodendrophora : 185, 216; Taeniophloeoda : 186, 237; Taenioplacoda: 243; Taeniothromboda : 241.

Genera: *Acanthochonium* : 139, 142, 145; *Anorygmaphyllum* : 139, 143, 156; *Astroblastocyclus* : 299; *Astroblastodiscus* : 189, 227; *Astroblastothylacus* : 230; *Astrocalamocyathus* : 188, 222; *Astrochartodiscus* : 189, 234; *Astrocyathus* : 139, 184, 187, 203; *Astrocyclus* : 184; *Astrodendrocyathus* : 188, 220; *Astrodiscus* : 184, 187, 212; *Astrolopas* : 184, 187, 211; *Astrophloeocyathus* : 237; *Astrophloeocyclus* : 189, 237; *Astrophloeothylacus* : 190, 239; *Astroplacocyathus* : 191, 243; *Astrothrombocyathus* : 190; *Astrothylacus* : 184, 187, 209; *Cyathothaelaea* : 139, 142, 152; *Cyathodactylia* : 139, 143, 160; *Hexorygmaphyllum* : 139, 144, 174; *Lioblastocyathus* : 188, 223; *Lioblastolopas* : 224; *Liocalamocyathus* : 214; *Liochartocyathus* : 189, 231; *Liocyathus* : 139, 184, 187, 191; *Liodendrocyathus* : 188, 213; *Liodendrolopas* : 214; *Liophloeocyathus* : 189, 235; *Lioplacocyathus* : 190, 242; *Liothrombocyathus* : 190; *Ptychoblastocyathus* : 188, 224; *Ptychocalamocyathus* : 216; *Ptychochartocyathus* : 189, 231; *Ptychochartocyclus* : 232; *Ptychochonium* : 139, 141, 144; *Ptychocyathus* : 139, 184, 187, 194; *Ptychodendrocyathus* : 188, 215; *Ptycholopas* : 198; *Ptychophloeocyathus* : 189; *Ptychophloeolopas* : 236; *Ptychoplacocyathus* : 190, 243; *Ptychothrombocyathus* : 190, 240 ; *Taenioblastocyathus* : 188, *Taeniocalamocyathus* : 219; *Taeniocalamolopas* : 218; *Taeniochartocyclus* : 189, 233; *Taeniocyathus* : 139, 184, 187, 199; *Taeniodendrocyathus* : 218; *Taeniodendrocyclus* : 188, 220; *Taeniodendrolopas* : 188, 216; *Taeniolopas* : 187, 201; *Taeniophloeolopas* : 189, 237; *Taenioplacocyathus* : 190, 243; *Taeniothrombocyathus* : 190, 241; *Tetraphyllum* : 143, 154.

Species group: *acuta*, *Cyathaxonia* : 171, pl. 46, figs. 3, 3a, b; *adhaesa*, *Taeniocalamolopas* : 218, pl. 63, figs. 4, 4a, b; *adscendens*, *Liodendrolopas* : 215, pl. 60, fig. 3; *alatum* var. *divisum*, *Anorygmaphyllum* : 158, pl. 37, figs. 3, 3a–f; *alatum* var. *indivisum*, *Anorygmaphyllum* : 158, pl. 35, figs. 2, 2a–c; *ampla*, *Zaphrentis* : 165, pl. 38, figs. 1, 1a, b; *articulatus*, *Taeniocyathus* : 200, pl. 52, fig. 3; *aspera*, *Zaphrentis* : 166, pl. 40, figs. 1, 1a–d; *aubeli*, *Astrodendrocyathus* : 221, pl. 64, figs. 1, 1a–d; *breviradiatus*, *Amplexus* : 150, pl. 33, figs. 6, 6a, b; **callosum* *Hexorygmaphyllum* : 179, pl. 45, figs. 1, 1a–h; *callosus*, *Taeniocalamocyathus* : 219, pl. 62, figs. 1, 1a–c; *cancellatus*, *Liocalamocyathus* : 214, pl. 60, figs. 4, 4a–f; *carinata*, *Cyathaxonia* : 191, pl. 47, fig. 32f; *catinifer*, *Liocyathus* : 193, pl. 51, figs. 2, 2a–d; *caudata*, *Zaphrentis* : 170, pl. 42, figs. 2, 2a–f; *compressa*, *Taeniolopas* : 202, pl. 57, figs. 1, 1a–c; *concamerata*, *Zaphrentis* : 164, pl. 37, figs. 1, 1a–d; *cornuformis*, *Amplexus* : 151, pl. 34, figs. 2, 2a–c; *coronata*, *Zaphrentis* : 169, pl. 42, figs. 1, 1a–e; *cuculliforme*, *Aulacophyllum* : 162, pl. 38, figs. 2, 2a–g; *deformis*, *Taeniolopas* : 201, pl. 53, figs. 2, 2a–c; *dilatatus*, *Astrocyathus* : 207, pl. 54, figs. 2, 2a–c; *elongatum*, *Aulacophyllum* : 163, pl. 39, figs. 2, 2a–c; *elongatus*, *Ptychocyathus* : 197, pl. 50, figs. 1, 1a–c; *excelsa*, *Cyathothaelaea* : 152, pl. 46, figs. 6, 6a–c; *excelsus*, *Astrodendrocyathus* : 188, pl. 47, fig. 8c; 220, pl. 61, figs. 2, 2a–c; *excelsus*, *Ptychocyathus* : 187, pl. 47, figs. 2a–c; 195, pl. 49, figs. 2, 2a–d, 3, 3a–c; *faviformis*, *Ptychoblastocyathus* : 226, pl. 66, figs. 1, 1a–c; *fissus*, *Ptychoblastocyathus* : 225, pl. 64, figs. 4, 4a–c; *flexuosus*, *Taeniodendrocyathus* : 218, pl. 63, figs. 3, 3a, b; *foliatus*, *Liocyathus* : 192, pl. 51, figs. 1, 1a–d; *formosus*, *Amplexus* : 147, pl. 34, figs. 1, 1a–e; *formosus*, *Astrophloeocyathus* : 237, pl. 70, figs. 4, 4a, b; *fragilis*, *Zaphrentis* : 167, pl. 40, figs. 2, 2a–d; *furcillatus*, *Ptychodendrocyathus* : 215, pl. 64, figs. 2, 2a–h; *geinitzi*, *Astrocyathus* : 187, pl. 47, figs. 4a–c; 203, pl. 50, figs. 2, 2a–d; *germinans*, *Ptychothrombocyathus* : 190, pl. 47, figs. 22a–c; 240, pl. 72, figs. 5, 5a, b; **giganteus*, *Astrothylacus* : 187, pl. 47, fig. 4e; 209, pl. 56, figs. 1, 1a, b; *gracilis*, *Ptychocalamocyathus* : 216, pl. 63, fig. 5a; *granulifer*, *Ptychocyathus* : 196, pl. 49, figs. 4, 4a; *helmerseni*, *Astrocyathus* : 206, pl. 54, figs. 3, 3a, b; *humilis*, *Ptychocyathus* : 197, pl. 50, figs. 4, 4a, b; *impressus*, *Astrophloeocyclus* : 190, pl. 47, fig. 20d; 237, pl. 70, figs. 5, 5a, b; *inditus*, *Astrocyathus* : 205, pl. 53, figs. 4, 4a, b; *indivisa*, *Cyathodactylia* : 161, pl. 37, figs. 3, 3a–c; *inflexus*, *Amplexus* : 149, pl. 33, figs. 3, 3a–d; *inflexus*, *Astrothylacus* : 211, pl. 57, figs.

2, 2a; *inversum, Acanthochonium* : 145, pl. 32, figs. 2, 2a–e; *kochi, Zaphrentis* : 164, pl. 37, figs. 2, 2a–d; *laevigatum, Ptychochonium* : 144, pl. 32, figs. 1, 1a–g; *late-aperta, Zaphrentis* : 163, pl. 32, figs. 6, 6a–c; *latus, Ptychocyathus* : 194, pl. 48, figs. 4, 4a–c; *laxus, Ptychochartocyathus* : 189, pl. 47, figs. 14a, b; 231, pl. 69, figs. 2, 2a; *loculatus, Liocyathus* : 193, pl. 51, figs. 3, 3a, b; **medioprofundus, Astrocyathus* : 208, pl. 55, figs. 3, 3a, b; **multiradiatum, Hexorygmaphyllum* : 180, pl. 45, figs. 2, 2a; *numismale, Anorygmaphyllum* : 159, pl. 40, figs. 3, 3a, b; **nutricius, Astrocyathus* : 204, pl. 52, figs. 4, 4a–d; *obtusum, Anorygmaphyllum* : 156, pl. 34, figs. 3, 3a; *ovatum, Hadrophyllum* : 155, pl. 43, figs. 5, 5a, b; *ovatum, Hexorygmaphyllum* : 177, pl. 44, figs. 3, 3a, b; *pauciradiatus, Amplexus* : 149, pl. 33, figs. 4, 4a, b; *piriformis, Lioblastocyathus* : 188, pl. 47, figs. 9a–c; 222, pl. 65, figs. 1, 1a–c; *planus, Astroblastodiscus* : 228, pl. 67, figs. 1, 1a, b (see footnote 2, p. 158); *planus, Taeniochartocyclus* : 189, pl. 47, figs. 15a, b; 233, pl. 69, figs. 4, 4a; *politum, Anorygmaphyllum* : 157, pl. 35, figs. 1, 1a–c; *primigenius, Liocyathus* : 187, pl. 47, figs. 1a–c; 191, pl. 48, figs. 1, 1a, b; *procerum* var. *gladiiforme, Hexorygmaphyllum* : 178, pl. 44, figs. 1, 1a–e; *procerum* var. *pugiunculiforme, Hexorygmaphyllum* : 177, pl. 44, figs. 2, 2a, b; *profunde-incisa, Zaphrentis* : 168, pl. 41, figs. 1, 1a–c, 2, 2a–c, 3, 3a, b; *profundum, Anorygmaphyllum* : 156, pl. 32, figs. 5, 5a–c; *profundum, Tetraphyllum* : 154, pl. 36, figs. 3, 3a–e; *profundus, Astroblastothylacus* : 230, pl. 68, figs. 2, 2a–c; *profundus, Ptychoblastocyathus* : 188, pl. 47, figs. 10a–c; 224, pl. 64, figs. 3, 3a–e; *profundus, Ptychocyathus* : 196, pl. 49, figs. 1, 1a–e; *prolixus, Astrocyathus* : 205, pl. 53, figs. 1, 1a, b; *pulcher, Amplexus* : 150, pl. 33, figs. 5, 5a–d; *radiatum, Hexorygmaphyllum* : 175, pl. 43, figs. 2, 2a–c; *raschettei, Liophloeocyathus* : 235, pl. 70, figs. 2, 2a, b; *richteri, Cyathaxonia* : 172, pl. 46, figs. 1, 1a–1; pl. 47, fig. 32e; *rostelliforme, Hexorygmaphyllum* : 176, pl. 43, figs. 1, 1a–e; *rostrata, Zaphrentis* : 166, pl. 39, figs. 1, 1a–d; *rugosa, Taeniodendrolopas* : 188, pl. 47, fig. 7a; 217, pl. 63, figs. 2, 2a, b; *schleiermacheri, Taeniodendrolopas* : 216, pl. 59, figs. 2, 2a–f; *socialis, Astrocyathus* : 209, pl. 59, figs. 1, 1a–e; *solidus, Astroplacocyathus* : 191, pl. 47, figs. 28a–c; *spinosa, Taeniolopas* : 187, pl. 47, figs. 3a–c; 201, pl. 51, figs. 4, 4a, b; *stellata, Cyathodactylia* : 161, pl. 36, figs. 2, 2a–d; *stigmosus, Ptychochartocyclus* : 232, pl. 69, figs. 3, 3a, b; *tenueradiata, Hallia* : 153, pl. 32, figs. 4, 4a, b; *tenue-stellata, Zaphrentis* : 170, pl. 43, figs. 4, 4a, b; *tenui-ramosus, Taeniothrombocyathus* : 241, pl. 72, figs. 4, 4a–c; *tenuis, Liocyathus* : 192, pl. 48, figs. 2, 2a, b; **tortuosus, Liocyathus* : 194, pl. 50, figs, 3, 3a–f; *triangulare, Hexorygmaphyllum* : 174, pl. 43, figs. 3, 3a–e; *triangularis, Cyathothaelaea* : 152, pl. 46, figs. 5, 5a–e; *trochiformis, Taeniocyathus* : 199, pl. 48, figs. 3, 3a–t; *tubaeformis, Astrolopas* : 187, pl. 47, fig. 4d; 211, pl. 57, figs. 3, 3a–g; *tubaeformis, Liodendrocyathus* : 213, pl. 60, figs. 1, 1a–g; *tubaeformis, Ptychodendrocyathus* : 188, pl. 47, figs. 6a–c; *turbineus Taeniocyathus* : 200, pl. 53, figs. 3, 3a; *umbilicatus, Amplexus* : 147, pl. 33, figs. 1, 1a, b; *undosa, Cyathodactylia* : 160, pl. 36, figs. 1, 1a–e; *vannifer, Amplexus* : 148, pl. 33, figs. 2, 2a–d; *virgatus, Liophloeocyathus* : 235, pl. 70, figs. 1, 1a, b; *vulgaris, Astrophloeothylacus* : 190, pl. 47, fig. 20c; 239, pl. 71, figs. 2 2a–c.